Weekly Cat Report

January 07, 2022

Executive Summary

Event	Affected Region(s)	Fatalities	Economic Loss (USD)	Page
Wildfire	United States	0	1.0+ billion	3
Winter Weather	United States	5	100+ million	6
Severe Weather	United States	0	Millions	7
Earthquake	China	0	193+ million	7
Flooding	Malaysia	3	10s of millions	7
Flooding	Middle East	14+	10s of millions	7
Flooding	Indonesia	2	Millions	8
Severe Weather	South Africa	10	Millions	8

Please note that any financial loss estimate is preliminary and subject to change. These estimates are provided as an initial view of the potential financial impact from a recently completed or ongoing event based on early available assessments. Significant adjustments may inevitably occur.

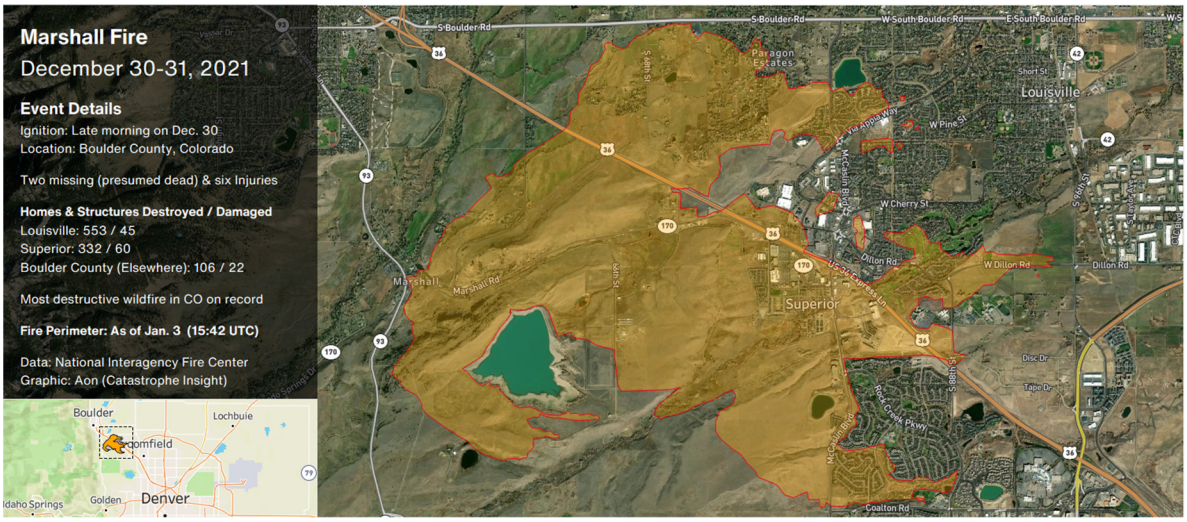
Along with this report, we continue to welcome users to access current and historical natural catastrophe data and event analysis on Impact Forecasting's Catastrophe Insight website: http://catastropheinsight.aon.com

United States: Wildfire

Overview

The combination of extremely dry conditions, hurricane-force downslope wind gusts from the Rocky Mountains, and ongoing severe drought aided in the most destructive wildfire on record in Colorado. The Marshall Fire was ignited during the afternoon of December 30 and quickly spread into the communities of Superior and Louisville (located just outside of the city of Boulder). Nearly 1,000 structures were destroyed; most of which were single-family homes. Another 127 were damaged. There were no confirmed fatalities, though two people remained listed as missing. This was anticipated to become Colorado's costliest wildfire on record for the insurance industry, with losses poised to reach well into the hundreds of millions (USD). The overall economic cost will exceed USD1 billion.

Meteorological Recap

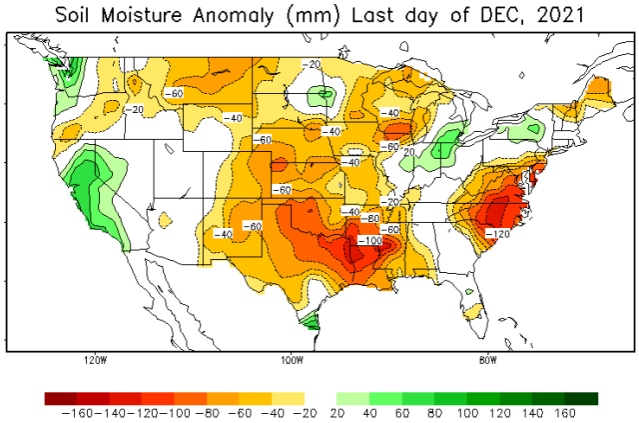


Strong westerly winds (from the Rockies) combined with unseasonably dry and warm conditions aided in creating volatile fire weather across the foothill communities in Northern Colorado on December 30 – particularly in portions of Boulder County. Extreme downslope winds, aided by a strong cross-mountain pressure gradient, resulted in hurricane-force wind gusts which exceeded 100 mph (160 kph) in Boulder and Jefferson Counties by the afternoon hours.

The table below shows selected wind gusts (mph) recorded in Boulder and Jefferson Counties on December 30. Data were provided by the National Weather Service (NWS) in Boulder:

Location	Gust (mph)
Arvada	115
Rocky Flats (Highway 93 & 72)	110
Boulder	108
White Ranch Open Space	103

Location	Gust (mph)
Northeast Crisman	102
Northwest Rocky Flats	98
Marshall	90
Wadsworth	81

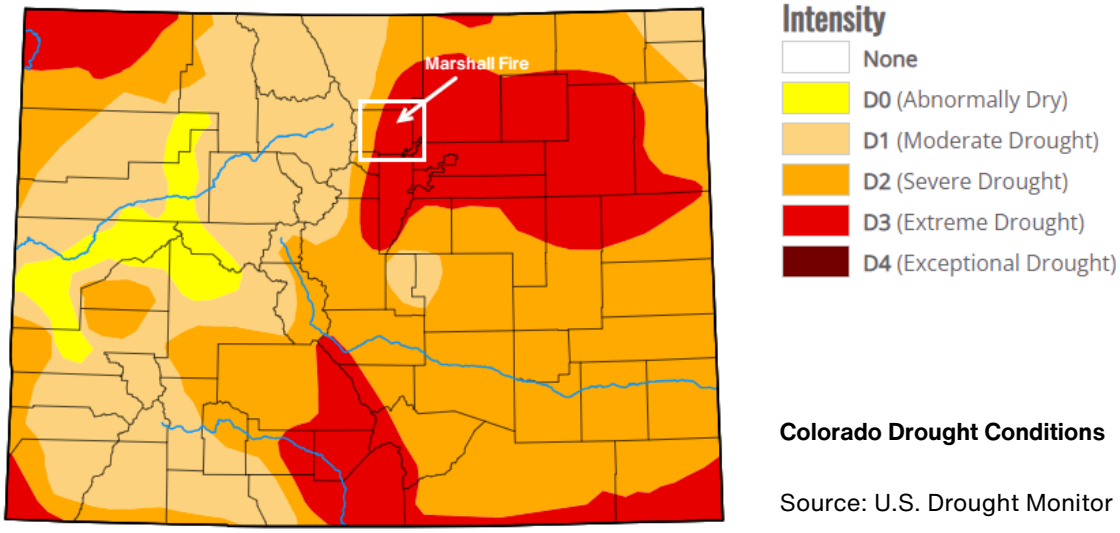


In addition, exceptionally warm and dry conditions through much of the autumn season in tandem with well below average snowfall generated environmental conditions favorable for significant wildfire spread. Data from the United State Drought Monitor (USDM) indicated Extreme Drought (level 4 out 5) conditions were present across much of eastern Boulder and Jefferson County on December 30. Data from the NWS showed record dryness since July and historically low snowfall across the Denver-Boulder region leading up to December 30. Mild conditions and lack of precipitation aided in drying out an abundance of grasses and vegetation which thrived in the wet spring several months prior, resulting in additional fuels for wildfires.

By the afternoon hours of December 30, multiple grass fires were ongoing in the region. These included the Middle Fork Fire and Marshall Fire which ignited near the wildland urban interface (WUI) in Boulder County. The WUI is known as the transition zone between unoccupied land and human development.

The explosive and wind driven growth of the Marshall Fire rapidly encroached upon density populated regions near Superior and Louisville in southern Boulder County. The expansive smoke plume generated by the wildfire was visible on weather radar and satellite imagery.

The fire quickly became the most impactful and damaging wildfire event in Colorado state history. Fortunately, a potent winter storm which generated accumulating snowfall across the fire perimeter by January 1, aided in minimizing additional fire growth. Fire officials reported that the Marshall Fire perimeter reached 100 percent containment by January 4, after affecting 6,200 acres (2,510 hectares) of land in Boulder County.



Colorado Drought Conditions

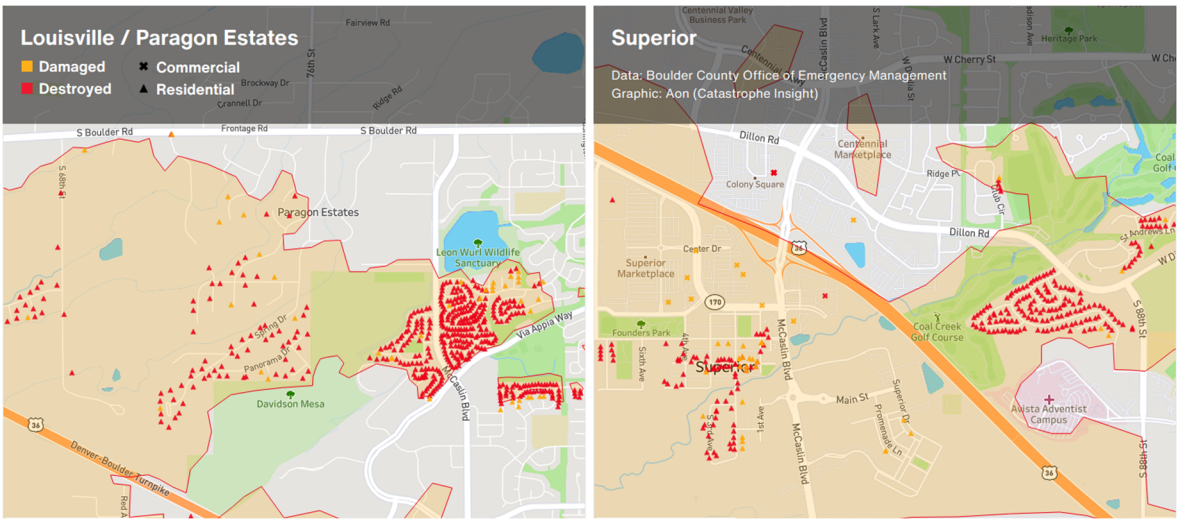
Source: U.S. Drought Monitor

Event Details

The unprecedented destruction and rapid growth of the **Marshall Fire** prompted the President of the United States to formally approve a major disaster declaration for affected communities in Colorado on January 1. Preliminary damage surveys indicated the Marshall Fire destroyed no fewer than 991 homes and businesses, while at least 127 were damaged. Most of the destroyed structures were in Louisville (553) and Superior (332), while the remainder were located elsewhere in incorporated Boulder County.

Structures affected by the Marshall Fire
Source: South Metro Fire Rescue

The fire prompted evacuation orders for no fewer than 33,000 people during the afternoon hours of December 30. Nearly 100,000 customers lost electricity during the event, many related to downed power lines from extreme winds. The Marshall Fire additionally impacted natural gas infrastructure in the region, and prompted Xcel Energy to shut off service to at least 13,000 customers. Furthermore, potential contamination of the local water supply resulted in boil water advisories for residents of Superior and Louisville.



Financial Loss

The record number of destroyed structures puts the Marshall Fire in position to become the insurance industry's costliest wildfire in Colorado. The insured loss is anticipated to reach well into the hundreds of millions (USD). The overall economic loss was likely to exceed USD1 billion.

Costliest Colorado Wildfires (Insured Loss; 2021 USD)

- East Troublesome Fire (2020): USD564 million
- Waldo Canyon Fire (2012): USD534 million
- Black Forest Fire (2013): USD487 million

United States: Winter Weather

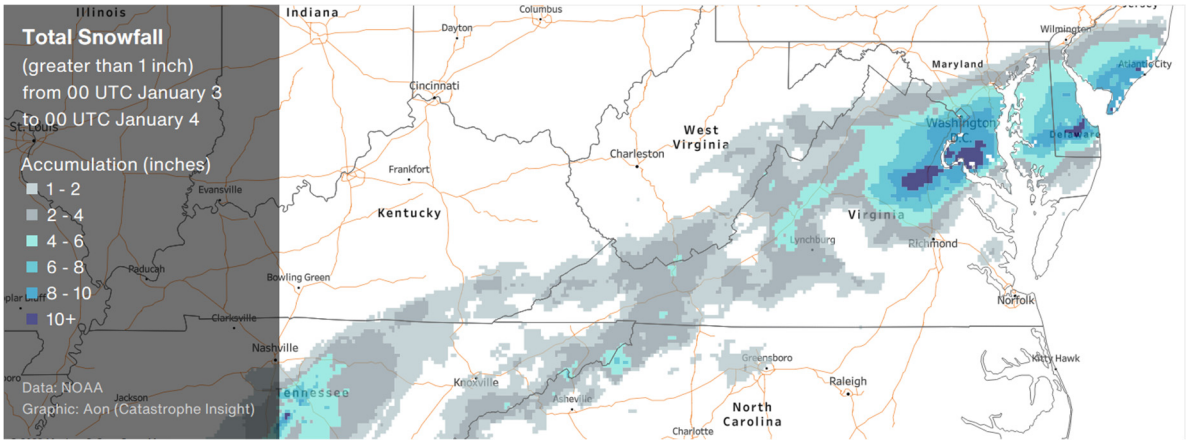
Overview

A potent and quick moving storm system resulted in impactful winter weather across the Appalachians and Mid-Atlantic on January 3. Intense snowfall rates and icy conditions produced significant traffic and flight delays. At the peak, no fewer than 800,000 power outages were reported. At least five fatalities have been confirmed. Total economic losses were expected to approach USD100 million.

Meteorological Recap

A dynamic low-pressure system and potent cold frontal boundary were the catalysts for an impactful winter storm across the Southeast and Mid-Atlantic on January 3. This system brought heavy rainfall and thunderstorms to portions of the Deep South and Carolinas, while an impactful winter storm unfolded across the Southern Appalachians and Mid-Atlantic. Maximum snowfall rates reached and exceeded 1 to 2 inches (25 to 50 centimeters) per hour.

The quick moving storm system resulted in widespread snow totals of at least 6 to 8 inches (15 to 20 centimeters). In **Maryland**, a maximum snowfall of 15.5 inches (39 centimeters) was reported in Calvert County, while in **Virginia** an accumulation of 14.6 inches (37 centimeters) was measured in Stafford County.



Event Details

Roughly 800,000 customers across the **Southeast** and **Mid-Atlantic** were without power – a majority were in Virginia. Virginia State Troopers responded to at least 559 traffic crashes and 522 calls regarding stranded vehicles on January 3. Rapidly deteriorating conditions stranded hundreds of motorists overnight along a 50-mile (80-kilometer) section of Interstate-95 in Virginia. In **New Jersey**, a State of Emergency was declared for five southern counties.

Air traffic was significantly impacted as Reagan National and Baltimore Washington airports issued ground stops because of snow and ice. The winter weather combined with surging COVID cases resulted in at least 3,000 canceled flights across the U.S. on January 3. At least five fatalities were reported, three of which were due to a traffic incident involving a snowplow near Washington D.C.

Natural Catastrophes: In Brief

Severe Weather (United States)

A pair of upper-level disturbances phasing across the central United States created a period of turbulent weather conditions between December 31 – January 2. The Storm Prediction Center (SPC) highlighted regions across the South and Tennessee Valley for an Enhanced Risk (level 3 out 5) for severe weather on January 1, aided by a strong jet stream and a warm and humid air mass. A State of Emergency was declared in Kentucky on January 1 due to flash flooding, power outages, and property damage. Strong convective winds resulted in damaged roofs and homes, downed trees and power lines, and localized flooding across the Mid-South and northern Alabama. Further north, accumulating snowfall impacted regions in the Midwest. Total economic losses were expected to reach well in the millions (USD).

Earthquake (China)

A magnitude-5.4 earthquake struck the boundary between Yunnan and Sichuan on the afternoon of January 2. The epicenter was 115 kilometers (71 miles) from the tourist spot Lijiang. According to Yunnan Earthquake Agency, a total of 30 people were injured from the shallow earthquake. As many as 8,100 houses were damaged, and at least 29,000 people were affected in Ninglang Yi and Yulong Naxi Autonomous County. Preliminary damage assessments by local authorities suggested that the total economic losses were CNY1.2 billion (USD193 million).

Flooding (Malaysia)

A monsoon surge between December 31 and January 3 resulted in widespread flooding over Peninsular Malaysia, two weeks after the previous damaging floods across large parts of the peninsula. Significant flooding occurred as water levels in area rivers were still moderately stressed from recent flooding episodes. As many as 14,000 people in seven states were affected. Johor was among the worst hit, with rivers in the Segamat district cresting in red alert levels, after receiving its highest seven-day rainfall. The heavy rain also caused landslides over Selangor, Negeri Sembilan and Johor. In eastern Malaysia, nearly 3,000 people were displaced and at least three fatalities were reported in Sabah. Total damages were expected to minimally reach the tens of millions (USD).

Flooding (Middle East)

Several days of torrential rains associated with a low-pressure system caused widespread flooding in the Middle East in the beginning of 2022. Floods resulted in large material damage and inundated roads in many parts of the region, partly because of insufficient or missing drainage systems. As a result, no fewer than 20,000 people were affected, and thousands were forced to leave their homes. At least eight fatalities and 14 injuries have been reported in Iran, and at least six people have died in Oman. Severe weather was also reported in UAE, Saudi Arabia, Kuwait, and further east in Pakistan and Afghanistan. Rainy weather is expected to continue in several Middle East regions in the coming days.

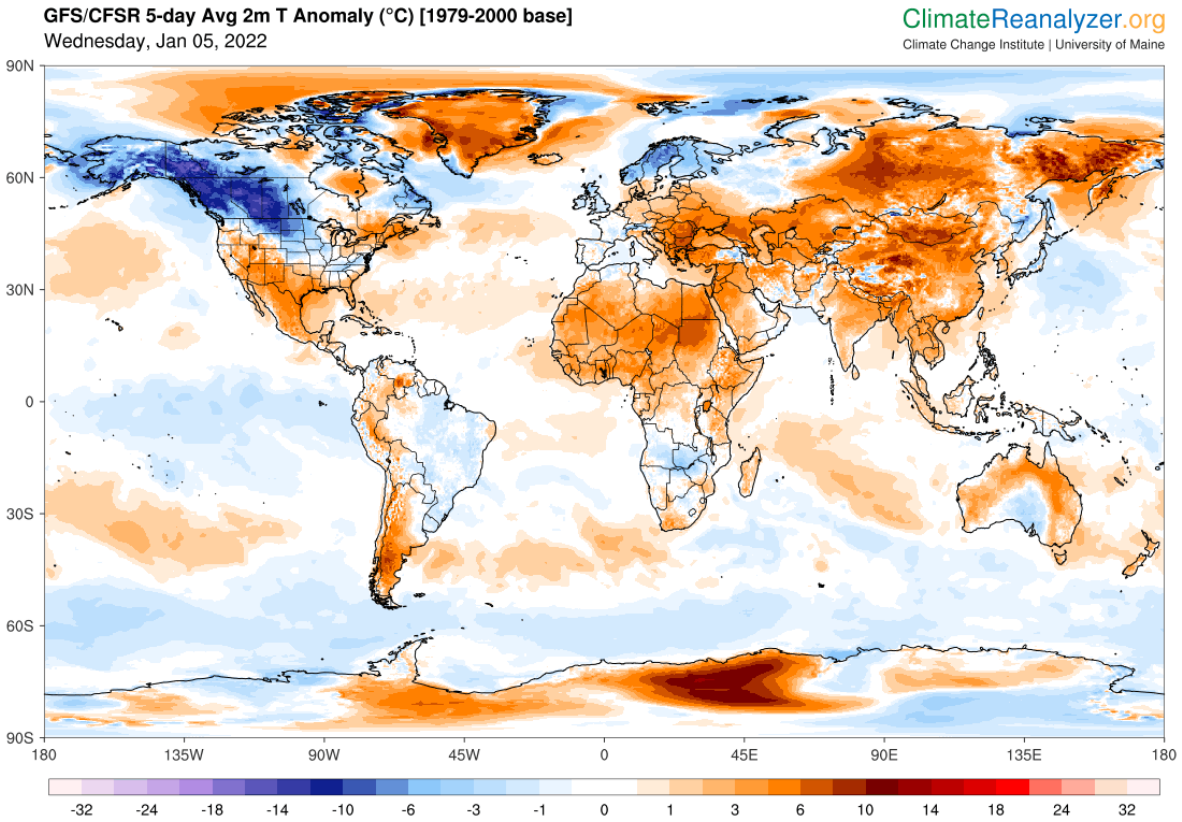
Flooding (Indonesia)

The northeast monsoon rain band since December 31 has resulted in flooding and landslides over North Aceh, East Aceh and North Sumatra. Nearly 30,000 residents were displaced in North and East Aceh alone, with two fatalities reported. More than 17,000 homes were indundated by floodwaters. In Padang Luwas Regency, North Sumatra, a state of emergency was declared after at least 15 villages were flooded. Economic losses were expected to reach well into the millions (USD).

Severe Weather (South Africa)

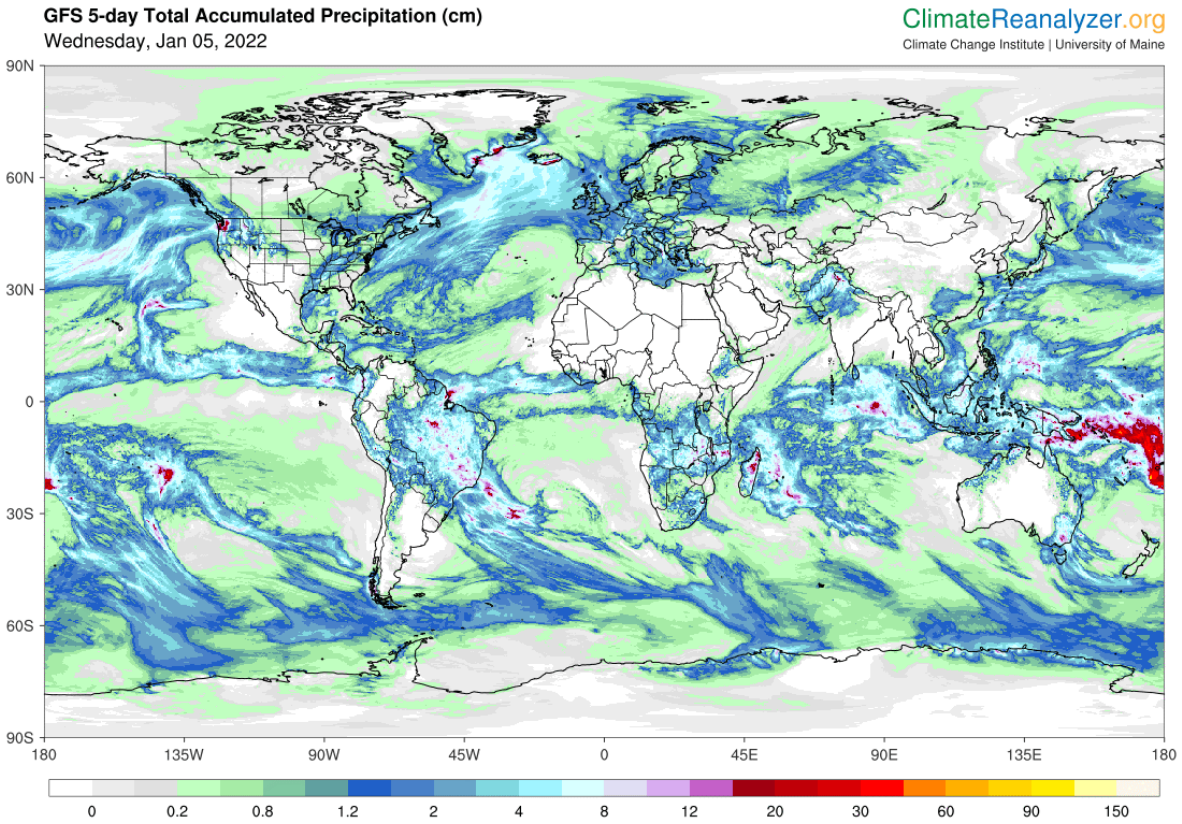
Episodes of severe storms and torrential rainfall impacted several regions of South Africa between December 12 and 30, particularly the Eastern Cape and KwaZulu-Natal provinces. During this period, flooding rainfall and large hail damaged or destroyed at least 1,000 homes in Eastern Cape, and 1,692 homes in KwaZulu-Natal. Extensive damage to regional infrastructure, power lines and agriculture was also incurred. Multiple roadways were damaged or rendered impassable. Ten people were killed and dozens of others injured. Total economic losses were expected to be in the millions (USD).

Global Temperature Anomaly Forecast



Source: Climate Reanalyzer, Climate Change Institute, University of Maine, USA

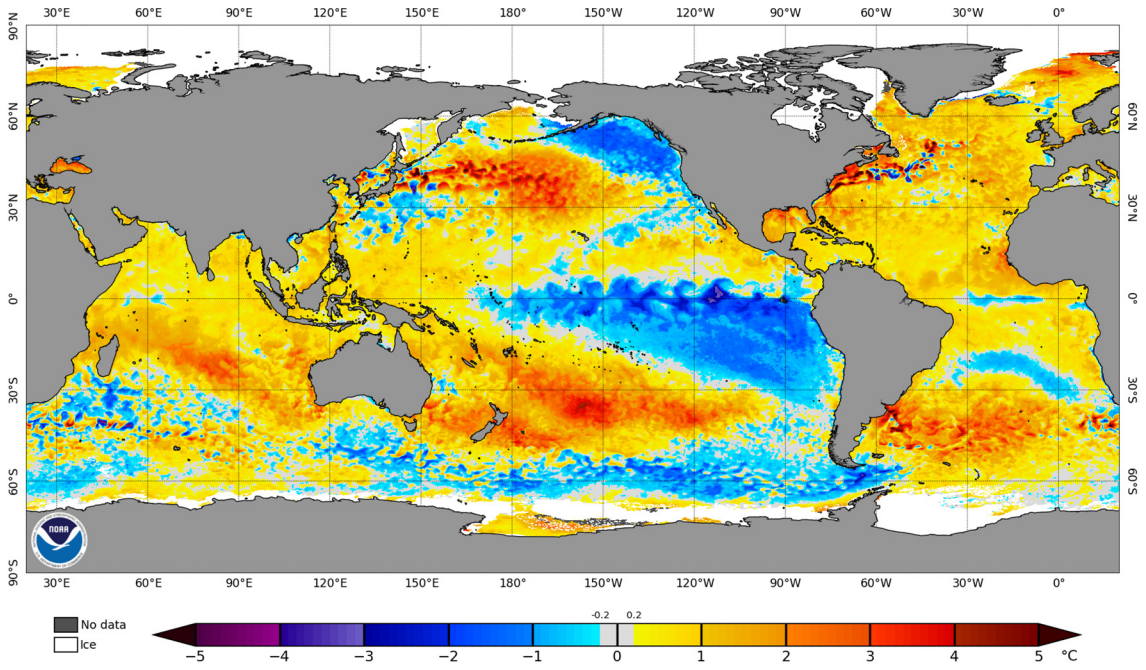
Global Precipitation Anomaly Forecast



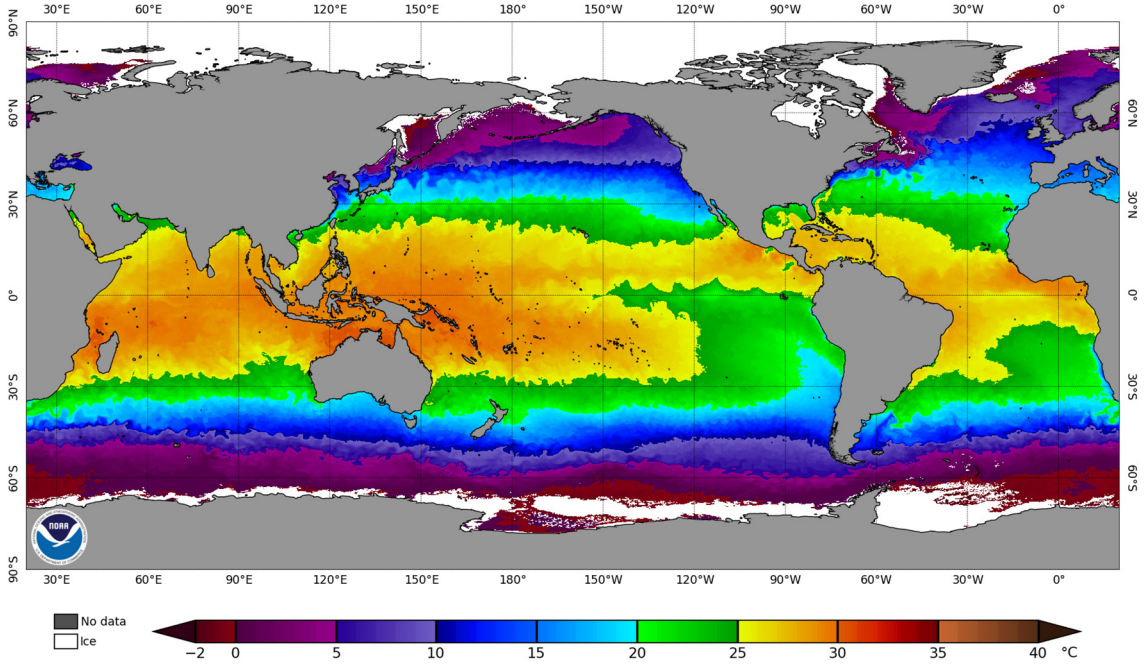
Source: Climate Reanalyzer, Climate Change Institute, University of Maine, USA

Weekly Sea Surface Temperature (SST) Maps (°C)

NOAA Coral Reef Watch Daily 5km SST Anomalies (v3.1) 4 Jan 2022



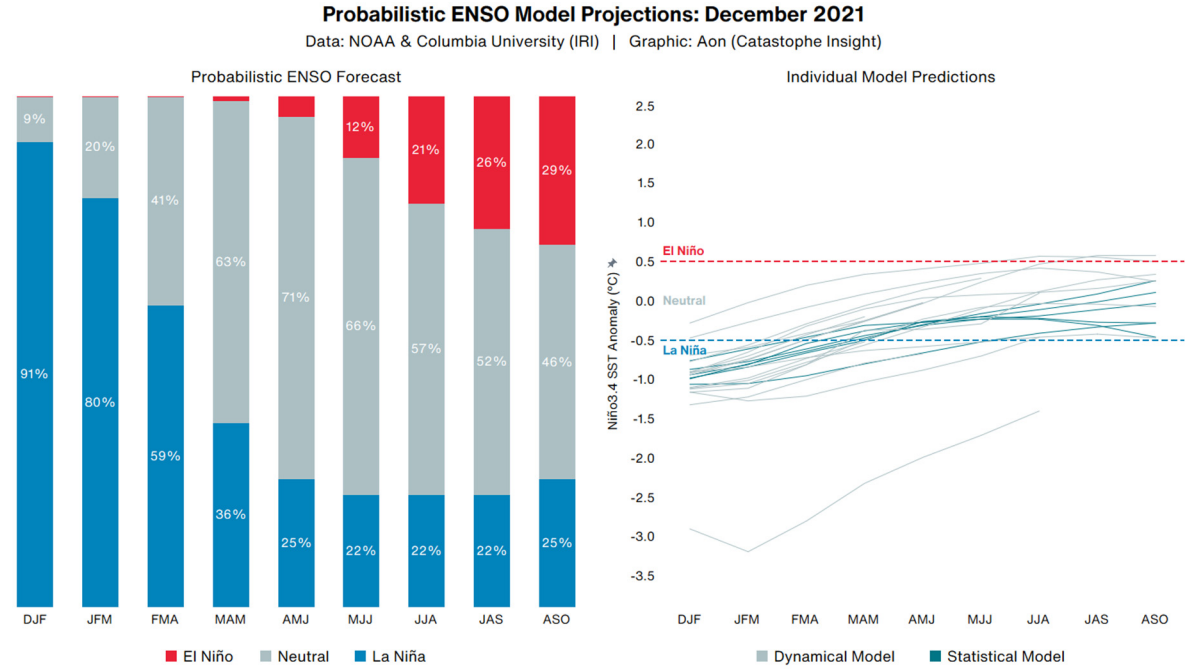
NOAA Coral Reef Watch Daily 5km Sea Surface Temperatures (v3.1) 5 Jan 2022



El Niño-Southern Oscillation (ENSO)

Overview

La Niña conditions have returned in the Central and Eastern Pacific Ocean, and NOAA has issued a “La Niña Advisory”. NOAA cites a 95 percent chance of La Niña conditions persisting through the Northern Hemisphere winter months, and a 60 percent chance of lasting through the spring (April to June). The agency also anticipates the possibility of a moderate strength La Niña at its peak before transitioning back to ENSO-neutral conditions by the Northern Hemisphere Spring of 2022.



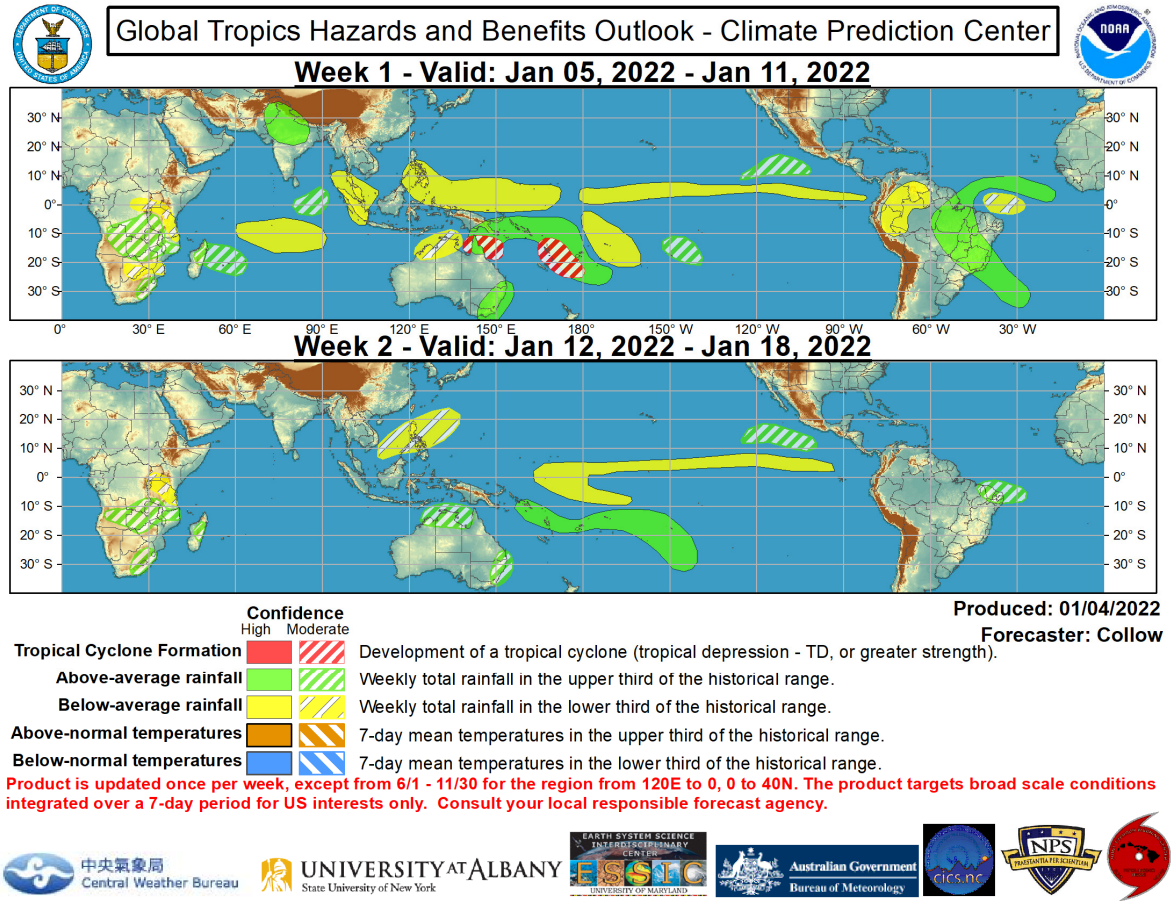
El Niño: *Warm phase of an ENSO cycle. Sea surface temperatures of +0.5°C occur across the east-central equatorial Pacific.*

La Niña: *Cool phase of an ENSO cycle. Sea surface temperatures of -0.5°C occur across the east-central equatorial Pacific.*

Neutral: *A period when neither El Niño nor La Niña conditions are present.*

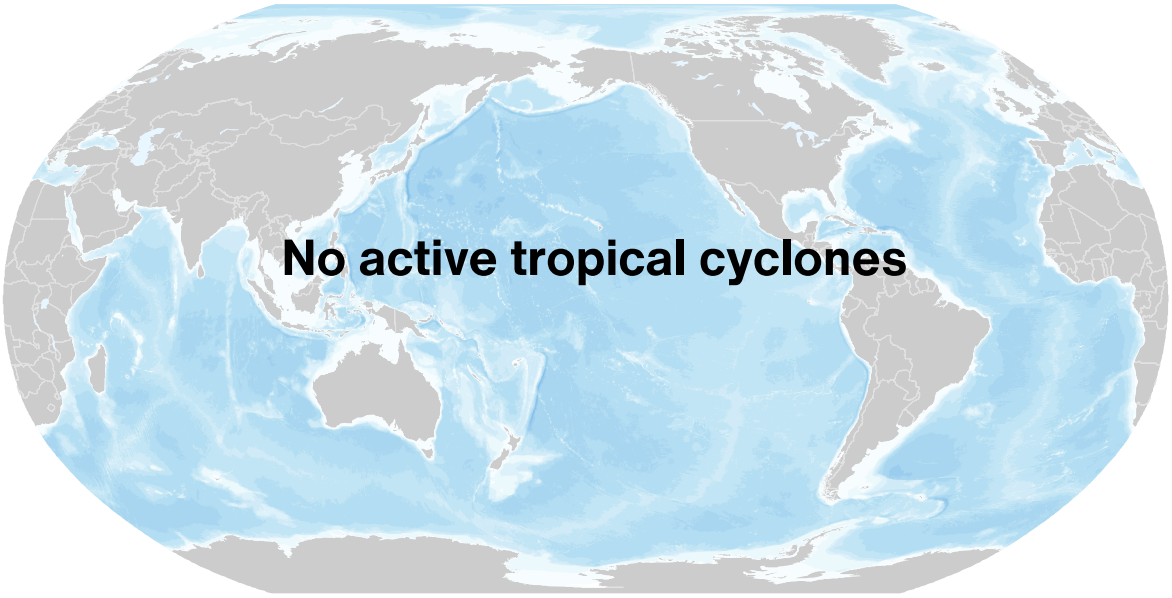
El Niño (La Niña) is a phenomenon in the equatorial Pacific Ocean characterized by a five consecutive 3-month running mean of sea surface temperature (SST) anomalies in the Niño 3.4 region that is above the threshold of +0.5°C (-0.5°C). This is known as the Oceanic Niño Index (ONI).

Global Tropics Outlook



Source: Climate Prediction Center (NOAA)

Current Tropical Cyclone Activity



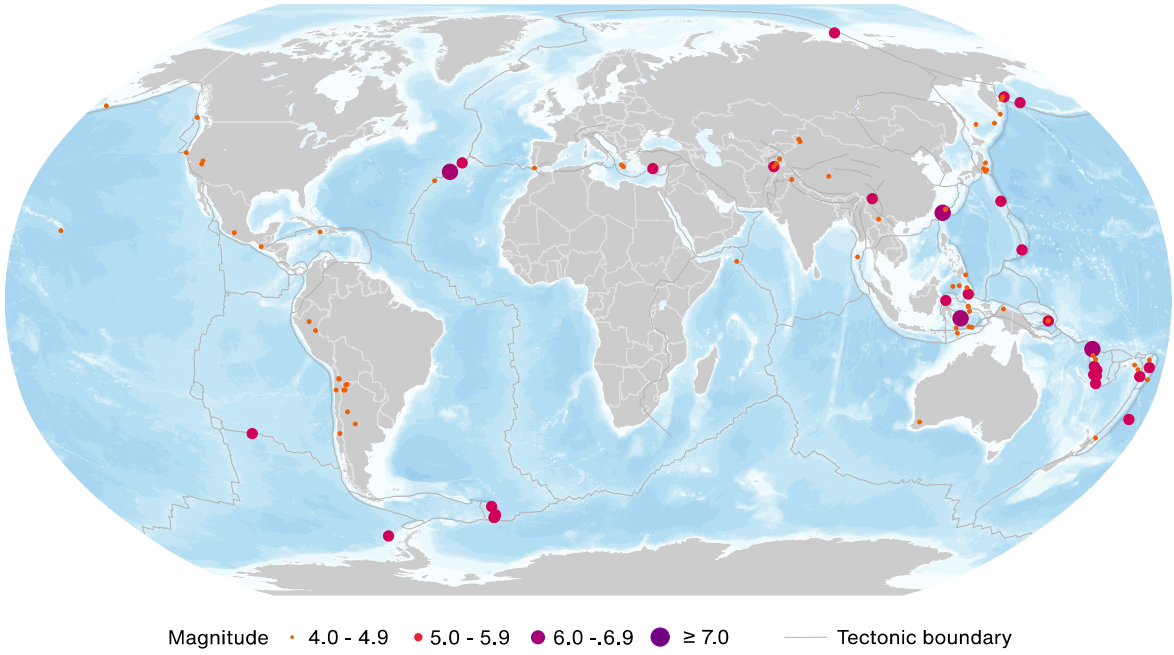
Tropical Depression Tropical Storm Category 1 Category 2 Category 3 Category 4 Category 5

Storm Name	Location	Winds	Location from Nearest Land Area

* TD: Tropical Depression, TS: Tropical Storm, HU: Hurricane, TY: Typhoon, CY: Cyclone
** N: North, S: South, E: East, W: West, NW: Northwest, NE: Northeast, SE: Southeast, SW: Southwest

Source: National Hurricane Center, Joint Typhoon Warning Center, Central Pacific Hurricane Center (NOAA)

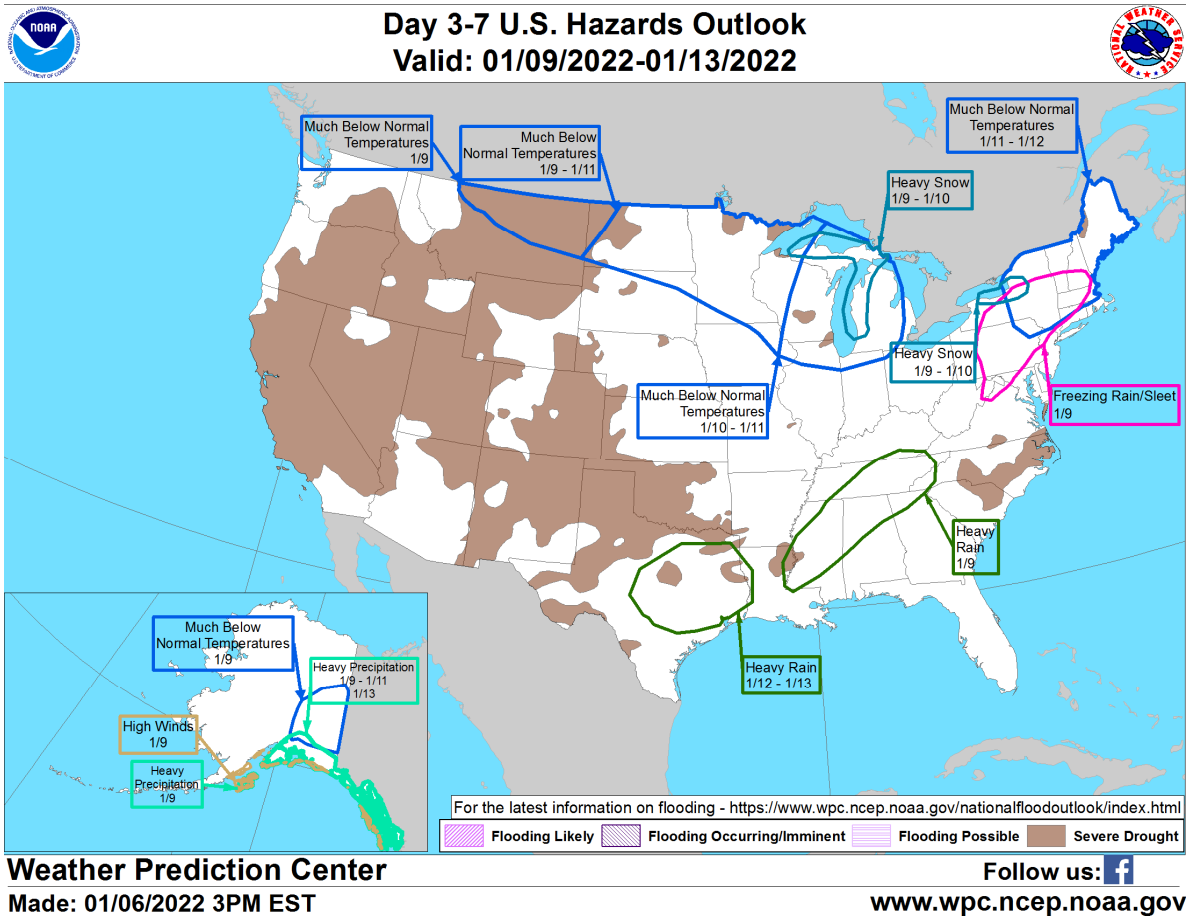
Global Earthquake Activity (≥M4.0): Dec 31 – Jan 6



Date (UTC)	Location	Magnitude	Epicenter
01/03/2022	13.19S, 166.82E	6.0	10 kilometers (6 miles) NW of Sola, Vanuatu
01/03/2022	24.00N, 122.24E	6.2	64 kilometers (40 miles) E of Hualien City, Taiwan
01/04/2022	35.26N, 35.24W	6.1	northern Mid-Atlantic Ridge
01/04/2022	4.80S, 125.05E	6.0	28 kilometers (17 miles) E of Katabu, Indonesia

Source: United States Geological Survey

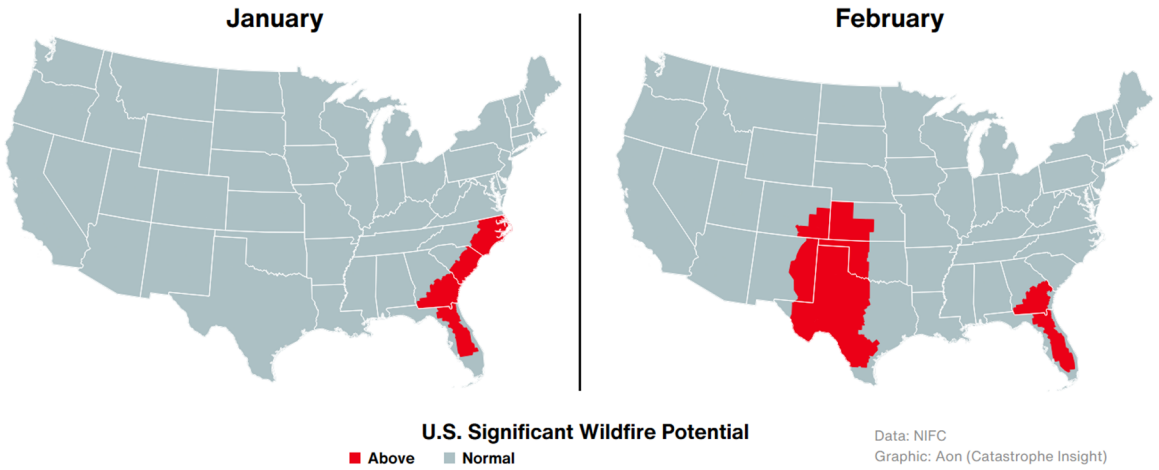
U.S. Hazard Outlook



- An amplifying upper-level trough and associated storm system will produce freezing rain and sleet across the Interior Northeast on January 9. Concurrently, moist southerly flow ahead of the system will bring heavy rainfall to parts of the Deep South.
- An intrusion of Arctic air will generate much below normal temperatures, which will progress from the Northern Tier to the Great Lakes and Northeast between January 9-12. Lake effect snow is likely downwind of Lakes Superior, Michigan, and Ontario during this period.
- A disturbance expected to interact with tropical moisture across the south-central U.S. is likely to produce heavy rainfall in the Southern Plains on January 12-13.

Source: Weather Prediction Center (NOAA)

U.S. Wildfire: Significant Fire Risk Outlook & Activity



Annual YTD Wildfire Comparison: January 3*

Year	Number of Fires	Acres Burned	Acres Burned Per Fire
2018	137	924	6.74
2019	34	50	1.47
2020	70	1,538	21.97
2021	33	112	3.39
2022	23	285	12.39
10-Year Average (2012-2021)	**26**	**211**	**8.12**

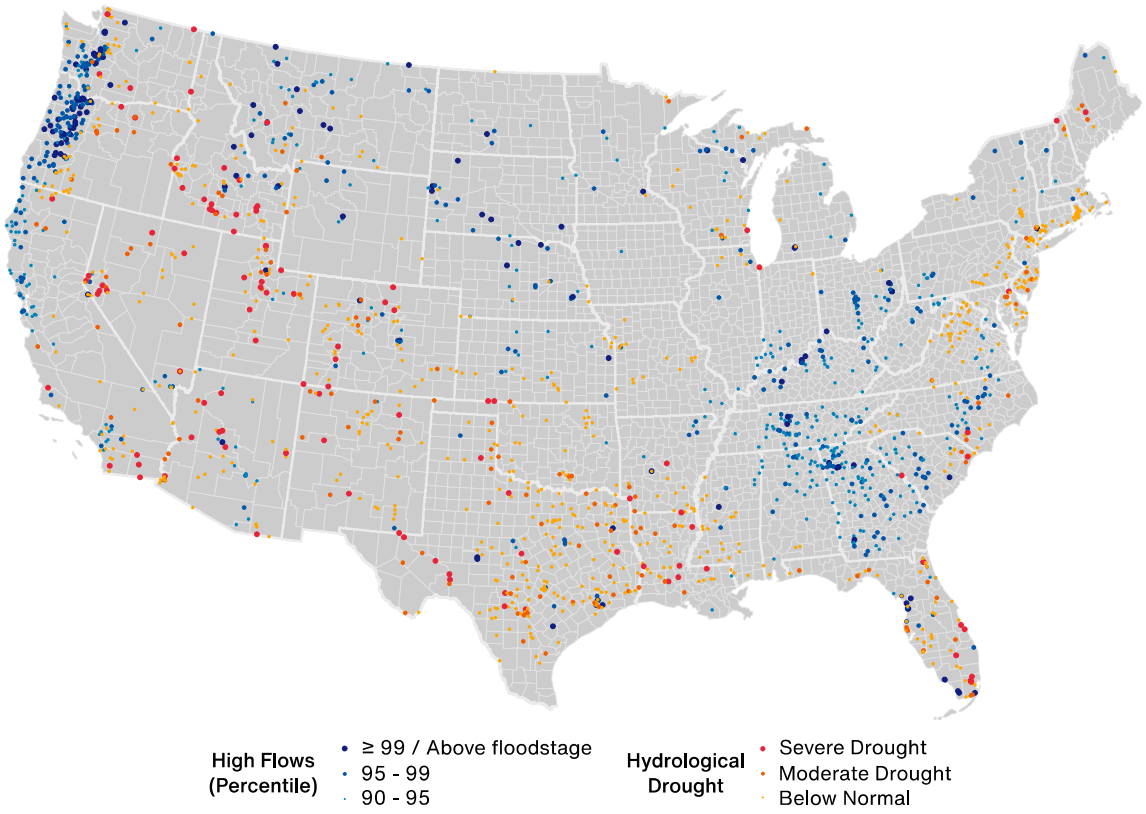
Top 5 Most Acres Burned by State: January 6

State	Number of Fires	Acres Burned	Acres Burned Per Fire
Texas	38	868	22.84
Louisiana	3	388	129.33
North Carolina	23	80	3.47
Georgia	8	41	5.13
Mississippi	4	25	6.25

*Most recent NIFC update

Source: National Interagency Fire Center

U.S. Current Riverine Flood Risk



A ≥99th percentile indicates that estimated streamflow is greater than the 99th percentile for all days of the year. This methodology also applies for the other two categories. A steam in a state of severe drought has 7-day average streamflow of less than or equal to the 5th percentile for this day of the year. Moderate drought indicates that estimated 7-day streamflow is between the 6th and 9th percentile for this day of the year and 'below normal' state is between 10th and 24th percentile.

Top 5 Rivers / Creeks: Highest Percentile for Water Height

Location	Current Stage (ft)	Percentile
Missouri River at Fort Benton, Montana	6.59	99.24
Weber River near Oakley, Utah	6.21	99.15
St. Louis River at Scanlon, Minnesota	4.93	99.12
Musselshell River at Harlowton, Montana	10.39	99.10
Dolores River at Dolores, Colorado	2.65	99.10

Source: United States Geological Survey

Source Information

United States: Wildfire
U.S. National Weather Service
U.S. Storm Prediction Center
Xcel Energy
Marshall fire: Map of destroyed or damaged homes and businesses, *The Denver Post*
2 missing, 991 homes destroyed in Marshall Fire, *9 News*

United States: Winter Weather
U.S National Weather Service
Virginia State Police
Winter Storm Spreading Snow, Strong Winds From Appalachians to the Mid-Atlantic, *Weather Channel*
I-95 in Va. reopens as motorists battle bailout traffic jam on Route 1*, WTOP*

Natural Catastrophes: In Brief
U.S. National Weather Service
U.S. Storm Prediction Center
Yunnan Earthquake Agency
Malaysia National Disaster Management Agency (NADMA)
Department of Irrigation and Drainage Malaysia
Major storm is bringing severe weather, flooding and snow to ring in 2022, *Washington Post*
Deadly Floods in Oman and Iran, *Floodlist*
Islamic Republic News Agency (IRNA)
Indonesia Disaster Management Authority, BNPB
Storms left trail of destruction in KZN, thousands of homes damaged, *The Citizen*
'Hailing sideways': Strong winds, hail as Eastern Cape storm continues, *The South African*
4 people killed, over 1 000 houses destroyed in KwaZulu-Natal by thunderstorms, *News 24*

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